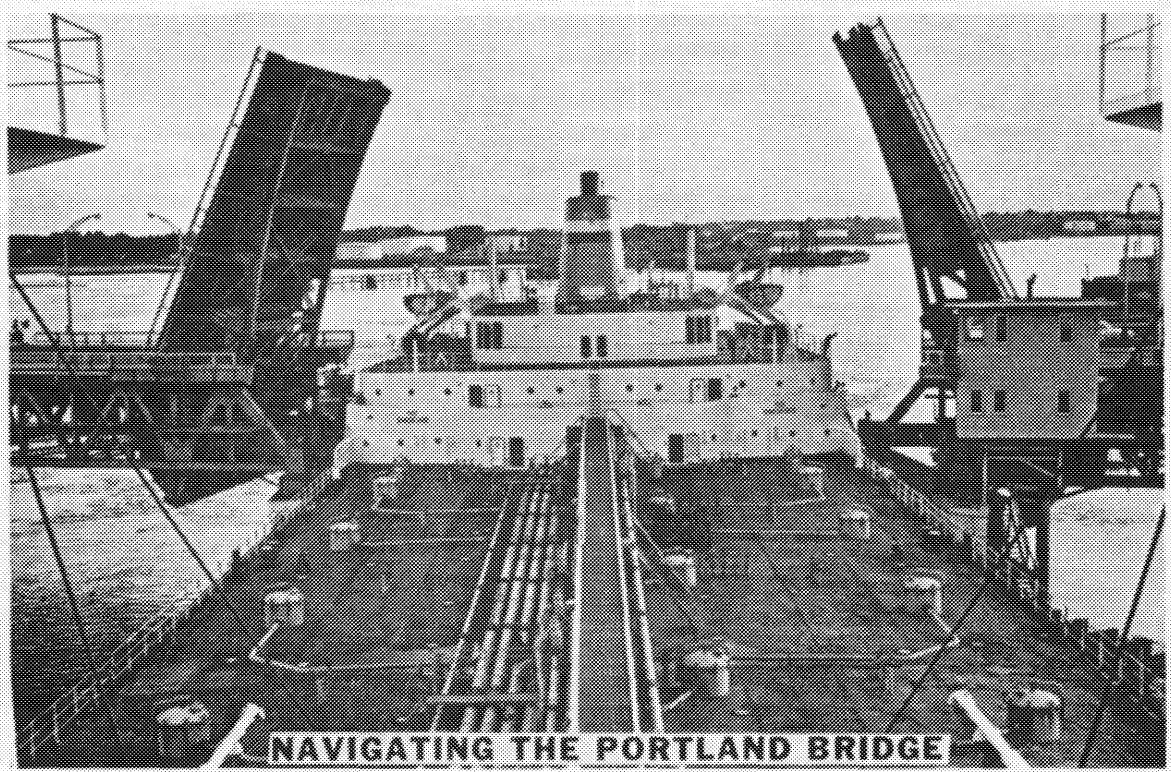
WATER RESOURCES IMPROVEMENT STUDY

for

NAVIGATION IN THE FORE RIVER PORTLAND, MAINE

Information Pamphlet



NAVIGATING THE PORTLAND BRIDGE

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

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PREFACE

This pamphlet presents a summary of the on-going study for navigation improvements of the Fore River in Portland Harbor. We trust it will help you to understand, the alternatives under consideration. The first few pages discuss the purpose of the study, the existing conditions, the needs and desires for improvement, and the evaluation criteria for the study. The remaining pages address the alternatives considered, the costs, the benefits, and an assessment of some of the environmental and social effects of the alternatives.

AUTHORITY AND PURPOSE OF STUDY

The Maine Congressional delegation introduced similar resolutions to the Committees on Public Works of the United States Senate and the House of Representatives on 19 February 1968 and 10 July 1969 respectively. The Senate Resolution is as follows:

> "RESOLVED BY....., THAT the Board of Engineers for Rivers and Harbors is herely requested to review the reports of the Chief of Engineers on Portland Harbor, Maine, published as House Document Numbered 216, Eighty-seventh Congress, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, with particular reference to providing greater project dimensions in the Fore River Channel, together with other appurtenant improvements in order to meet present and anticipated requirements of deep-draft navigation."

The resolutions resulted from the desire of civic and business interests to improve the waterway.

The New England Division of the Corps of Engineers has the responsibility to implement the study and prepare a response for the Chief of Engineers to Congress. The objective of the study is to identify and evaluate in the interest of navigation:

- existing conditions and commerce
- restrictions and problems
- needs and desires of all interests
- future conditions and commerce
- possible alternatives for improvement
- impacts of alternatives including no action
- recommendations for possible modification (s) if advisable

The study provides for appropriate input and coordination with all interests in order that the report reflect the desires and needs of the Nation in general, the region affected and the specific study area involved.

DESCRIPTION OF THE STUDY AREA

Portland Harbor affects a large geographical area that includes most of the State of Maine, portions of New Hampshire, and the Province of Quebec, Canada; the latter as a result of the Portland-Montreal crude oil pipeline. The authorized Federal navigation project includes a 45 foot entrance channel from Casco Bay to a 45 foot maneuvering and anchorage basin northwest of House Island, a 35 foot deep channel in the Fore River, a 30 foot deep anchorage off the eastern end of Portland, a 30 foot deep approach channel to Back Cove, a 14 foot deep channel between the Grand Trunk Railroad and Tukey Bridges, 12 foot deep channel in Back Cove, a stone breakwater about 2,000 feet long on the southerly side of the mouth of the inner harbor, a stone breakwater about 900 feet long from Spring Point to Spring Point light, and the maintenance of Soldier Ledge Channel in Hussey Sound at a depth of 40 feet.

The commercial importance of Portland Harbor can be measured by the commodities shipped on the waterway. Major commodities moved on the waterway include crude petroleum, and petroleum products fish, paper, and iron and steel plates. The waterway also has a sizeable passenger service. Essentially Portland is a receiving port for petroleum. Of the fifty-four piers, wharves, and docks in the port twenty nine are located on the Portland (north) side of Fore River, twenty on the south side of Fore River and three on Casco Bay in South Portland. Two are located at East Deering north of Portland at the entrance to Back Cove.

All of the major receiving docks for petroleum product are located on the Fore River. The companies located here include: Chevron, Texaco, Amoco, Mobil, Getty, Shell, BP Gibbs, Gulf, Exxon, and Northeast Petroleum. Distribution of petroleum to other points in Maine is made from this area by vessels, barges, railroad tank cars, truck, and pipeline. This does not mean that Portland is the only petroleum product distribution port for Maine; however, it is the most important.

An important feature of the Fore River waterway is the highway bridge between Portland and South Portland. Known as the Portland Bridge or Million Dollar Bridge it has four traffic lanes and is the major transportation link for Portland and the cities and towns to the south and southeast. The bridge has a navigation opening for vessel passage. This consists of two bascule leaves which are raised to create a maximum horizontal clearance of 98 feet. This clearance restricts the size of the vessels which can navigate the upper portion of the Fore River Channel and is the major navigation problem of the Fore River.

NEEDS AND DESIRES

The needs and desires of all interest groups have been identified in several ways, such as correspondence, public meetings, workshop meetings, and individual contacts. A public meeting was held in South Portland on

23 April 1969. Attendance included Federal, State, and City officials, commercial and private interests, and representatives of the local press.

The Director of the Maine State Port Authority made the following requests on behalf of the American Marine Institute and its member companies with product terminals located on Fore River and other local interests.

a. Increase the depth of Fore River channel from 35 to 45 feet; mean low water, upstream to the Boston and Maine Railroad Bridge.

b. Increase the width of the channel from 300 to 400 feet from the former site of the Vaughan Bridge, to the B&M Bridge.

c. Increase the depth of turning basin just east of former site of Vaughan Bridge from 35 to 45 feet mlw.

d. Increase the horizontal drawspan clearance in the Portland Bridge to about 200 feet.

In addition to studying the above modifications of the existing Federal project, consideration was given to the alternative of using a common multi-use product terminal facility on the ocean side of the Portland Bridge. The facility would be used for the discharge of petroleum products, to the nine major oil companies on the upstream side of the Portland Bridge.

Local interests strongly indicated that any alterations to the bridge be undertaken with a minimum interference to vehicle traffic. "Any lengthy delay or rerouting traffic through other arteries during the construction of the 200-foot clearance would result in a tremendous loss to the community."

As alternatives to widening the existing bridge, it was requested that studies be made to determine the economic feasibility of replacing the Portland Bridge with a high level fixed span bridge having a minimum vertical clearance of 135 feet above mean high water.

CONCEPTS AND EVALUATION CRITERIA

This study measures the current and future needs for navigation with proposed improvements against the existing conditions without improvement. Their period of measurement, known as the project life, is 50 years. In this study, the project life begins in 1985 and ends in 2035. Specific areas evaluated are costs of improvements, benefits to be realized, and impacts of any actions.

Project costs are the value of all land, labor, and material used in constructing operating and maintaining a project. Prices used for project evaluation reflect the values prevailing at the time of the study.

The benefit cost ratio is merely a ratio between annual equivalent benefits and annual equivalent costs. For a project to be justified the

benefits must be equal to or greater than the costs.

Deep draft harbors or projects are those harbors or projects capable of or designed for ocean-going commerce.

Economic benefits attributable to water resource improvements primarily reflect an increase in national output of goods and services and the increase in national economic efficiency.

Navigation benefits are the transportation savings that would result from providing improvements to a harbor or waterway. These savings are the difference in transportation costs between "without" improvement conditions and "with" improvement conditions. Generally, deep draft navigation benefits, i.e., transportation savings, result from reductions in vessel operating costs due to providing new channels, anchorage areas, turning basins, or an alternative mode for the movement of commodities on a waterway.

The term "impact" is used interchangeably with the term "effect" to mean any potentially significant change brought about by an alternative plan. Impacts can be economic, social, environmental, institutional, beneficial or adverse.

An impact assessment provides, to the extent possible, the identification and measurement of the changes expected from alternative plans as based upon the "without" conditions. Many of these changes can be described only in a highly qualitative manner, particularly in the case of environmental and social impacts. Whether or not an impact is by nature beneficial or adverse is often subject to personal interpretation. In some instances there is little disagreement, but often an impact perceived as beneficial by one group is viewed as highly adverse by another. Thus, the final classification of impacts can only be detemined by subjective judgements made by a process of trade-off analysis. The input of the affected public is especially relevant and critical in this analysis so that a final evaluation clearly sets forth what is gained or foregone by choosing any given alternative.

DESCRIPTION OF ALTERNATIVES

The study to date has formulated a number of alternatives to answer the deep draft navigation needs of the harbor. Seven alternatives have been found worthy of study. In addition, the "do nothing" or "without" project conditions have been identified to serve as a base of measurement for the alternatives. The following pages describe the physical components of the alternatives, the over all costs, and the annual costs and benefits. A summary of all costs, benefits, cost sharing allocations, and impacts assessment is included at the end of the pamphlet. Also maps showing the geographical location of the alternatives when identifiable are included.

ALTERNATIVE 1

This is the do-nothing or without project conditions. The present waterway with a 35 foot authorized depth would be maintained. The existing bridge would continue in operation. The bulk of the commerce on the waterway would continue to be transported in vessels which are small enough to transit through the bridge opening. Present vessels have beams (widths) up to 90 feet. As demand for petroleum products grow increased vessel trips to the harbor would be needed to supply the petroleum users. The increased trips would bring additional possibilities of vessel collisions, oil spills, pollution, and bridge collisions. Traffic interruptions from bridge openings would increase as the vessel trips through the bridge increase. The cost of transporting oil products to Portland would be higher than if navigation improvements were made.

The largest vessels transiting the bridge average 690 feet long, 90 feet wide, and are 36 feet deep. This represents a carrying capacity of 35,000 dead weight tons (dwt). The safety record to date of vessel operators, pilots, and assisting tugs has been excellent. However, the movement of a large oil tanker through the bridge requires sound operating procedures and judgment. Unforeseen mechanical failure or inability to react to changed conditions quickly enough can result in a major accident perhaps causing closure of the bridge, major pollution of the harbor, and even loss of life.

ALTERNATIVES 2 and 3.

These alternatives are similar in considering the alteration of the existing bridge. The existing bascule navigation opening would be replaced with a vertical lift span. The horizontal clearance would be enlarged from 96 feet to 200 feet. The difference between the plans is the depth of the channel. Alternative 2 would not increase the existing channel depth of 35 feet. The turning basin at the upstream end of the channel would be enlarged to accommodate tankers of 50,000 dwt (dead weight tons) size. This size vessel is 740 feet long, 102 feet wide, and 40 feet deep. Alt. 3 would increase the depth of the channel and turning basin to 40 feet to accommodate tankers of 50,000 dwt size but with less delay waiting for the tide to provide sufficient water depth for safe navigation. The costs, benefits, and benefit cost ratios are listed below. All dollar values are given in thousands.

Alternative	Total Costs	Total* Annual Costs	Total Annual Benefits	Benefit/ Cost Ratio
2	47,480	3,180	1,090	0.34
3	61,870	4,170	3,020	0.72

* Includes annual maintenance costs.

These alternatives would close the bridge to all vehicular traffic for a period of about two years. As a result of this Portland and South Portland have passed resolutions opposing these alternatives.

ALTERNATIVES 4 and 5.

These alternatives are similar in considering the replacement of the existing bridge with a high level bridge. A navigation opening of 200 feet horizontal and 135 vertical would be provided. Locations for a bridge of this type have not been selected. The Maine Department of Transportation commissioned a study which has identified possible corridors in which a bridge might be constructed and developed preliminary costs of construction. Further analysis of locations has not been accomplished. The difference between the plans is the channel depths. Alternatives 4 and 5 would have corresponding depths of 35 and 40 feet. Also each plan would enlarge the turning basin to accommodate tankers of 50,000 dwt size.

The costs, benefits, and benefits - cost ratios are listed below. All dollar values are given in thousands.

Alternative	Total Costs	Total* Annual Costs	Total Annual Benefits	Benefit/ Cost Ratio
4	51,130	3,430	1,260	0.37
5	65,515	4,410	3,190	0.72

* Includes annual maintenance costs.

ALTERNATIVES 6 and 7.

These alternatives are similar in considering the replacement of the existing bridge with an adjacent low level bridge. A navigation opening of 200 feet horizontal and 135 feet vertical would be provided by a vertical lift span. The bridge would be located upstream of the existing bridge and tie into the existing approach roads in Portland and South Portland. The channel depths would be different for each alternative; Alternative 6 - 35 feet deep - no change from the existing depths, Alternative 7-40 feet deep, a depth increase of 5 feet. Each plan would enlarge the turning basin at the upstream end of the channel. Vessels using the channel would be sized to 50,000; dwt. The costs, benefits, and benefit - cost ratios are shown below. All dollar values are in thousands.

Alternative	Total Costs	Total* Annual Costs	Total Annual Benefits	Benefit/ Cost Ratio
6	35,350	2,370	1,150	0.49
7	49,740	3,360	3,080	0.92

* Includes annual maintenance costs.

ALTERNATIVE 8

This alternative consists of a common receiving terminal and pipeline distribution system. The terminal would be located north of the Portland Pipeline Pier #2 in South Portland and be capable of accommodating tankers in the 50,000 dwt range. No channel deepening would be required but the berth areas would need to be dredged. An intermediate storage and pipeline distribution system would link the terminal with the existing storage and distribution centers on the Fore River. This alternative would eliminate the need for the large vessels to go through the bridge. Small vessels and barges which supply other points along the Maine Coast from Portland would continue to transit through the bridge.

The costs, benefits, and benefit-cost ratio are shown below:

Alternative	Total Costs	Total* Annual Costs	Total Annual Benefits	Benefit/ Cost Ratio
8	30,220	2,820	3,000	1.06

* Includes annual maintenance costs.

OTHER PLANS CONSIDERED

Several additional plans were examined which were proven to be not feasible or desirable. The dredging of the Fore River channel to 45 feet was investigated but discarded because of insufficient support by the waterway users.

The construction of a deepwater terminal in Luckse Sound between Long Island and Cliff Island with underwater pipelines to Long Island thence to Peaks Island and finally to South Portland was considered. This plan, while feasible from an engineering standpoint, would have the capability to receive large vessels far in excess of what is needed to supply Portland Harbor with petroleum product.

The use of Portland Pipeline Pier #1 on the Fore River for a common terminal was considered instead of constructing a new terminal as in Alternative 8. Pier #1 would have to be upgraded to receive and unload 50,000 dwt tankers Other measures such as added fire protection, piping, metering, and pipeline connection to the tank farm would be needed. While this plan has the possibility of reduced costs as compared to Alternative 8, the Portland Pipeline Corp has stated that the facility is used as a back up terminal for Pier #2 and at the present time could not be considered to be available for development as a common terminal.

SUMMARY OF ENVIRONMENTAL CONCERNS

ENVIRONMENTAL SETTING OF FORE RIVER

The Fore River is an estuary, and estuaries are influenced by both fresh and salt water. In this case, the Fore River receives fresh water from Capisic Pond, the Channel's headwaters, the Old C and O Canal, the Stroudwater River and Long Creek. The Atlantic Ocean, of course, is the source of saltwater. The normal tide range is about 10 feet.

Numerous biological studies have shown that estuaries are very productive, the Fore River is no exception. The primary source of productivity in estuaries usually comes from salt marshes associated with them. The upper portion of the Fore River has these marshes, while the lower section has very little salt marsh remaining. For this discussion, the estuary will be arbitrarily subdivided into two sections: the area below I-295 and the area above it.

a. Below Route I-295 - Extensive tidal mudflats are the predominate features of the lower Fore River. Many invertebrates inhabit these areas, but generally the Fore River organisms are small in size. The marine worm (Nereis spp.) is found there, and is one of the important links in the food web. The worms digest plant material changing it into protein which can be consumed by higher forms of life. Soft-shelled clams (Mya arenaria) also inhabit the mudflats, although they are also generally small and slow growing. Large beds of blue mussels are present, as well as the ubiquitous common mud snail.

These organisms also change plant materials into forms that higher organisms can use, and therefore are important in the food web. For example the marine worms are fed upon by numerous shore birds, such as the East Sandpiper, Killdeers and Semi-plamated Plover. The blue mussel and mud snails serve a similar purpose for other life forms. The larval forms of both provide food for many species of fin fish; while the adult is fed upon by water-fowl such as Buffleheads, Greater Scaup, and Golden eyes. These birds feed in the Fore River in late fall and winter. Another example is the mud snail which is very abundant in both the mud flats and the marsh grasses. Mallards and Black Ducks feed extensively upon these snails. This food source is especially valuable during winter months when other food sources are covered by snow. The Great Blue-Heron and Kingfisher feed on many of the species of fin fish found in the river including mummichogs and sticklebacks, which feed upon the larval forms of marine worms and mussels.

In the river itself, are found such abundant species as isopods, amphipods, and shrimp. These animals support other larger fin fish predators, such as Winter Flounder, Alewives, Rainbow Smelt, Brook Trout, Striped Bass and occasionally Menhaden.

b. Above Route I-295 - In striking contrast to the mudflats of the lower Fore River is the extensive areas of saltmarsh cord grass and saltmarsh hay on the upper Fore River. These are primary producers, and therefore both species contribute substantially to the productivity of the estuary. Studies show the Fore River saltmarsh cordgrass produces 4.1 tons/acre and the saltmarsh hay 10.0 tons/acre. Nutrients from these plants are transported into the river by the tides and become assimilated into the food web. Other plant species are also found in this section, but these two are the predominant ones.

To summarize, the area below I-295 is very industrialized. The major feature of this area is the tidal mudflats. The flats are fairly productive, and these flats are used by numerous species of birds for feeding. Above I-295 lies extensive areas of saltmarsh. The marshes are very productive, and they are the major contributors to the Fore River estuary. The entire estuary supports many forms of wildlife.

DISPOSAL SITE

Presently, the Corps does not have a specific site for disposing of the dredged materials for this project. However, the Corps will be conducting studies on a disposal site suggested by the local fishing community for the Portland Harbor maintenance dredging project. If the site is acceptable, then this area will likely be used for the improvement project.

ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

The 8 plans or alternatives can be subdivided into 5 general categories. This allows for easier analyzing of the impacts resulting from the alternatives. See Table I on the next page for a chart of the categories.

ALTERNATIVE I

The "No Action" alternative would continue with the present conditions. That is, the Fore River channel would be maintained at 35 feet, and there would be continued disposal of dredged materials. This would occur periodically.

The maintenance dredging would lead to resuspension of pollutants into the water column. That is, undetermined amounts of oil, grease, heavy metals, and organic matter could go into suspension in the river's water. The oil and grease adversely affect larval and adult organisms. However, the amount of oil and grease released would be minor when compared to past oil spills that have taken place in the river.

Table I

Summarization of Alternatives

Alternatives	Category	Depth
1	No Action	35'
2	Modification to present bridge (rejected by local people)	35'
3	" " "	40'
4	High level bridge	35'
5	" "	40'
6	Adjacent low level bridge	35'
7	" " "	40'
8	Common terminal	40'

Some heavy metals would be released from the sediments, but the major portions would probably remain ionically bonded with clay particles. There is the possiblity that some heavy metals would be incorporated into the food chain and become biologically magnified. There is as yet incomplete understanding concerning the reaction of heavy metals in the marine environment, and amount of each heavy metal that can be tolerated by marine life.

The decomposition of organic matter requires oxygen. Dredging will suspend organic matter in the water column; therefore the oxygen content will be lowered as the matter is decomposed. However, reduction would be very localized and slight in this volume of water, consequently the dissolved oxygen concentration should return to normal within a few hours.

Dredging would cause an increase in turbidity. Turbidity occurs when any type of particle is suspended in the water column. The finer the material and the higher the velocity of the water, the greater the turbidity -- or the greater the amount of material in solution.

The suspended material can drift into adjacent areas where it may settle out of suspension. When this happens, bottom living organisms can be smothered. Dredging, of course, would kill many of the organisms found in the sediments. However, some organisms would leave the area or are able to dig themselves out. Also, turbidity can disrupt the predator prey relationship, shore birds may no longer be able to find marine worms because they have been covered up, and fish which use sight to capture prey may be unable to do so. However, these conditions are usually transistory.

At the disposal site, essentially the same impacts would occur. Some bottom dwelling or sessile organisms would be buried, while others with the ability would move out of the area. Heavy metals will be released at the dump site, but scientific knowledge has not progressed sufficiently to make an exact determination. Turbidity would also increase in the levels of the water column at the dump site due to the higher average velocities found at the 40 and 80-foot depth.

These adverse effects would fluctuate with the amount of dredging undertaken. The less the dredging the smaller the impact.

ALTERNATIVES 2 AND 3

These alternatives have been rejected by the local people.

ALTERNATIVES 4 AND 5

A high level bridge with a channel depth of 35 or 40 feet would cause several adverse impacts. The building of the bridge could lead to the accidental discharge of pollutants into the river. The impact would depend upon the quantity and type of materials discharged. In addition, a loss of estuarine habitat would result. The exact amount would depend upon where the bridge is built, and whether piling or fill is needed for the bridge supports. The dredging impacts would be similar to the "No Action" alternative. Except, generally the impacts should increase as the amount of dredging increases. However, this is not the case for pollutants in the sediment. In this instance, most of the pollutants are found in the first few feet, and therefore any increase in dredging beyond this level should not materially increase the amount of pollutants.

ALTERNATIVES 6 AND 7

An adjacent low bridge with a channel depth of 35 or 40 or feet, would have the same impact as the previous three categories.

ALTERNATIVE 8

A common terminal and pipeline could have several effects. Dredging of a berth would be required, and a pipeline would be required to run to each storage terminal. Some mud flats in the Fore River would be disturbed with many of the organisms present being killed and with the loss of these areas for feeding stations for higher forms of animal life. Disposal other material would cause similar impacts as previously discussed.

The loss of upland habitat would be minimal since the plan calls for the maximum use of existing rights-of-way.

MAGNITUDE OF DISCUSSED IMPACTS

Although all the impacts presented might occur, these impacts may not all be biologically significant. For example, the amount of tidal mudflats disturbed may be inconsequential when compared to the total amount present in the Fore River, and the area's ability to support the local biota may not be substantially impaired. In addition, portions of these flats will become recolonized soon after construction activities cease. Furthermore some beneficial effect could result. With larger vessels using the port, fewer trips could be required in transporting the same

quantity of fuel --- fewer trips mean less handling and handling is a primary source of spills.

In the Corps' biological assessment, it was determined that there are four major areas of impact. Inclosed is an outline of these impacts. From these criteria, it was determined that, biologically speaking, the common pipeline would be the most acceptable.

SOCIAL AND ECONOMIC CONCERNS

The greater Portland area in Cumberland County, Maine, is comprised of nine communities: Portland, South Portland, Westbrook, Falmouth, Cape Elizabeth, Gorham, Scarborough, Cumberland, and Yarmouth. The first three are cities, the latter six are towns. The three cities provide most of the economic activity for the area. The towns are basically residential. Portland and South Portland will be most affected by any alteration of the area under study.

The Fore River presents a natural barrier separating the Portland Peninsula to the north from South Portland and the residential communities located further south and west. Two bridges cross this barrier: the Veterans Memorial Bridge, located at the southwesterly end of the peninsula and the Portland Bridge (also known as the Million Dollar Bridge).

The Veterans Memorial Bridge primarily services traffic moving between points to the north and south. The Portland Bridge primarily services local, suburban traffic moving to and from the south.

Although reports on the population growth of Portland are often contradictory, evidence indicates population growth in the rest of the Portland area. The Updated Portland Area Comprehensive Transportation Study (PACTS) by Maine's State Highway Commission, concludes an overall population increase of about one percent a year from 1963 to 1969 but a greater increase of travel activity in the area. The number of estimated travel trips increased an average of 3.6 per year.

In 1960, employment in the Portland region was 10 percent greater than the employed residential labor force. An improved economy between 1963 and 1969, according to the PACTS updated report, resulted in an increased employment rate. This phenomenon may explain the greater increase of travel trips.

Portland continues providing the major economic influence in the study area while influencing areas outside of the greater Portland region. The Portland Peninsula is the major employment center for the whole region. When compared to other leading centers in this sparsely populated state, Portland's importance takes on greater proportions. The 1970 U.S. Census identified 65,116 people living in Portland. Thus it is by far the largest city in Maine and perhaps the major center of social and economic activity north of Boston. Traffic on the two bridges, mentioned earlier, reflects these social and economic characteristics.

In their Bridge/Tunnel Crossing Study, Portland Harbor-Fore River Portland-South Portland, (prepared by Fay, Spofford and Thorndike for Maine's Department of Transportation), the authors conclude that "collisions or malfunctions have caused extensive traffic congestion due to the closing of the (Portland or Million Dollar) bridge for repairs. Each closing results in a detour for approximately 30,000 vehicles daily". Veteran's Memorial Bridge is the alternative and requires an additional eight miles per trip.

The above mentioned study also concludes that "the narrow opening of the draw creates a difficult navigation problem which has resulted in many collisions, with damages to the bridge structure and to ships. With each collision, there exists a potential pollution problem due to spillage of materials into the harbor." Under normal circumstances whenever the bridge is drawn to its up position, traffic is delayed. Caught in the delay, at times, are fire engines, ambulances, and other emergency vehicles.

A new bridge increasing the navigation opening and the height of the bridge, would alleviate or eliminate traffic delays. However, the Fay, Spofford & Thorndike report concludes that the existing bridge can generally accommodate estimated traffic volumes far into the future. "... But a new facility will do so with far less congestion than will the existing facility, as a result of the improved design.

The city of Portland is divided into twelve neighborhoods. Their boundaries coincide with census tract boundaries so that statistical comparisons are possible. In Portland the bridge entrances and exits are located in the West End community, extremely close to the Downtown Community. The additional neighborhoods are Eastend, Oakdale, Ocean Ave., East Deering, Rosemont, Deering Center, North Deering, Riverton, Nasons Corner, and Stroudwater. The bridge is important in feeding traffic to Portland's downtown area, where the bulk of Portland's businesses and activities are located.

Downtown and West End, the neighborhoods closest to the bridge, are the poorest in Portland in terms of median income. They have the greatest number of units, and their percentage of deficient and/or substandard housing is approximated only by the East End community. According to the 1974 Land Development Plan, Portland, Maine, prepared by the Portland Planning Department, the waterfront area of the city is one of the most valuable assets in terms of potential for new growth, three major types of planned uses for the area are contemplated. The area in the vicinity of the Million Dollar Bridge is included in this waterfront transformation.

"Approximately 15 acres of the area adjacent to the bridge has been designated as an area of transformation. Plans call for the demolishing of several housing units and a redesigned approach to the bridge. The current structural condition in the area shows 58% of the structures to be deficient... A recommended realignment of the York Street bridge approach calls for the re-routing of the 25,000 cars which use the Million Dollar Bridge. The new bridge approach, in conjunction with the proposed residential clearance, would provide a two-acre site for new residential development in this area."

The quality of life in a particular region is often a function of complex interacting social, economic, and environmental factors. It affects and is affected by other components of the socio-economic structure. Each alternative plan for the area being studied will have social, environmental, and economic impacts. These impacts may interfere or enhance plans prepared by the planning agencies of the cities involved.

ALTERNATIVE I - Do nothing

a. The "Million Dollar Bridge" will remain as is. As the demand for petroleum products distributed throughout Portland Harbor increases, the number of bridge openings will increase.

b. As the bridge openings increase, more frequent traffic slowdowns for motorists crossing during bridge openings can be expected.

c. The probability for possible boat collisions would increase as would the probability for oil spillages.

d. As such collisions increase, the cost of maintaining the bridge would increase.

e. As population and traffic increases, volumes of traffic on the existing bridge would become heavier and different traffic patterns may evolve.

A do-nothing alternative would have the least effect on present traffic patterns and may interfere least with projected development plans for the area's immediate future.

ALTERNATIVES 2 AND 3 - Alteration of the existing bridge and possible channel deepening.

a. These alternatives would close the Million Dollar Bridge for approximately 2 years and create a great deal of traffic disruption on other routes to the Portland peninsula.

b. Businesses, especially those in the Portland downtown area, would probably feel the effect of the traffic disruption as shoppers looked elsewhere for their commodities and services.

c. The area, as a whole, would probably offset financial losses since work on a new bridge would create hundreds of new jobs during bridge construction or alteration. Where such workers would come from, where they would live, projections on how much they would spend, how the new jobs would alter the present work force in the area, etc., are unknown at this time.

d. The altered bridge would still be opened periodically to allow for the passage of vessels.

e. The possible added tax burden or bond flotation to aid in financing bridge construction.

f. The altered bridge would be safer for vessel traffic and help in minimizing oil spillages.

g. The altered bridge would accommodate traffic for 50 years or more after its opening - thus averting congestion, and would require less maintenance.

ALTERNATIVES 4 AND 5 - Replacement of the bridge with a high level bridge and possible channel deepening.

Although the existing bridge would remain in operation until a new bridge is constructed, many of the issues and questions raised earlier are valid. In addition to similar concerns such as taxes, bonds, or rerouting of traffic (to a lesser degree) in the short run, creation of new jobs and possible consequences, other questions must be considered. These alternatives would eliminate all vessel restrictions due to a bridge. However, among the bridge alternatives, these plans would be the most costly. Many of the additional questions focus on the location of the new bridge and on the issue of relocation.

a. Would homes and businesses be required to relocate. If so, what provisions would be made?

b. Who would supervise the operations?

c. How would people be compensated?

d. In the long run, how would the bridge's new location affect businesses?

e. Would a new bridge site affect present planning and development projections?

ALTERNATIVES 6 AND 7 - Replacement of bridge with adjacent low level bridge with vertical lift and possible channel deepening.

There would be short term interruption of traffic flow due to construction. Questions of possible future payment for the new bridge, as well as the possible relocation of some structures remain as issues.

Of all the bridge alteration plans, however, these alternatives provide the least disruptive in the long run, since the new bridge would be constructed adjacent to the present Million Dollar Bridge. These plans would eliminate the present navigation width restrictions but would not eliminate the vehicular traffic interruption due to bridge opening as a result of vessel traffic.

The larger question with these alternatives is; after all the inconveniences what has really changed for the people of the greater Portland area? A bridge that will be good for some indeterminate time in the future would be replaced so that larger boats would be able to navigate. The citizens of Maine will be spending money and will be inconvenienced, yet most of the benefits would be accrued, as transportation savings for the nation as a whole and not necessarily to the specific locale.

ALTERNATIVE 8 - Common terminal and pipeline distribution system

The social and economic impacts of this alternative are contingent upon the location and construction of the new facilities, the amount and availability of land required for a tank farm, the possible relocation of business, a favorable location for the pipeline route, conflict with current plans for growth, and a determination of who would build and pay for the project. The bridge openings would still, be required for small coastal tankers and barges which account for over half of the bridge openings.

EVALUATION OF ALTERNATIVES

Evaluation of feasible solutions to the deep draft navigation problems of Fore River in Portland Harbor, has considered the economic, environmental and social effects of each solution. It is important to realize that neither the magnitude of the problems nor the projected demand for petroleum products will be diminished in the future. There is no plan which offers a solution that is either inexpensive or does not have a major environmental or social impact.

Evaluation of the economic justification for all feasible alternatives yields only one plan, which has a benefit-cost ratio greater than one. This plan is Alternative 8, the common terminal and pipeline distribution system. All other plans are not economically justified.

The environmental and social evaluations attempt to measure the tangible and intangible effects of the solutions on both short and long term basis. Preliminary assessments to date indicate that alteration or replacement of the existing bridge is less desirable than a common terminal system. If the intermediate surge storage could be eliminated, much of the adverse effects of this plan would be reduced.

SUMMARY AND FINDINGS

The study has attenpted to identify and formulate various solutions to the navigation problems within Fore River. The basic plans for improvement include: a. various plans for alteration or replacement of the existing bridge coupled with a possible channel deepening to 40 feet, and b. the construction of a common terminal and pipeline distribution system eliminating the need for large vessels to transit the existing bridge. All plans would allow delivery of petroleum products to Portland Harbor in larger vessels. The use of larger vessels would result in transportation savings which would accrue to the Nation in general.

The study results indicate that all plans are feasible but the common terminal and pipeline system is the only justified plan of improvement. Under existing authorities the Corps of Engineers cannot participate financially in or construct such a facility. The planning and construction

of a common terminal and distribution system can be accomplished by non-Federal interests including private interests, industry, a state port authority, or any combination of thereof. Subsequently a report will be prepared detailing the study investigations and findings with a recommendation that no channel deepening or bridge alterations be accomplished in the interest of navigation on the Fore River channel at this time.

ADDED STUDY ELEMENT - SOLDIERS LEDGE - HUSSEY SOUND

At the request of Senator Muskie and the Maine Department of Environmental Protection, the Corps of Engineers and the United States Coast Guard are examining methods to improve navigation in Hussey Sound. Soldier Ledge, located in Hussey Sound between Long Island and Peaks Island has a depth at mean low water of 40 feet. Fore vessels 40 feet deep and greater, Soldier Ledge could be considered dangerous to navigation and thus require extra precautions and alertness by operators when transiting through the area.

Since work on this study element was only recently initiated no conclusions or recommendations have been reached. The Corps will consider removing the ledge to provide additional depth of water. The depths to be considered are: 45, 50, 55, and 60 feet. Also the benefits to be gained and the effects of removing the ledge will be analyzed. If insufficient benefits are realized to justify an improvement the depth will not be increased. During this investigation, coordination will be done with all applicable state and Federal agencies, interested parties, and a public meeting held if necessary.

SOCIAL AND ECONOMIC BENEFICIAL AND ADVERSE EFFECTS

CONSIDERATION	ALTERNATE 1 DO NOTHING	ALTERNATES 2 and 3 ALTERATION OF EXISTING BRIDGE POSSIBLE CHANNEL DEEPENING	ALTERNATES 4 and 5 REPLACEMENT WITH HIGH LEVEL BRIDGE POSSIBLE CHANNEL DEEPENING	ALTERNATES 6 and 7 REPLACEMENT WITH ADJACENT LOW LEVEL BRIDGE WITH VERTICAL LIFT - POSSIBLE CHANNEL DEEPENING	ALTERNATE 8 COMMON TERMINAL AND PIPELINE SYSTEM
Bridge Openings	Continue Increasing.	Bridge closed for two years. After two years bridge openings would continue but reduced.	Upon completion, openings not necessary.	Bridge openings would continue, but would be reduced.	Bridge openings for small and local vessels.
Traffic	More frequent slow downs for motorists. More time spent on crossing bridge.	Traffic detoured for two years, creating traffic congestions elsewhere. Less slow downs in long-run.	Traffic detours and congestions during construction. Would alleviate slow downs in long run.	Detours and congestions during construction. Would eliminate bridge congestions in long run.	Alleviates traffic slow downs due to bridge openings.
Local Business	No change.	Short run losses to some business close to Million Dollar Bridge. Gains to businesses in area not dependent on bridge access.	Change dependent on length of bridge, locaton of exits, and construction time.	Change minimized but dependent on bridge exits.	No change.
Safety	Increasing probability of oil spillages and collisions. Delay of emergency vehicles.	Rerouting of emergency vehicles during alterations. Reduced probabilities of spillages and collisions.	Reduced possibility of spillage and collisions.	Reduced probability of spillages and collisions.	Reduced probability of spillages and collisions.
Aesthetics	No change.	Change Minimal.	Dependent on architectural designs.	Dependent on architectural designs.	Additional tanks and piers.
Projected Land Development Plans	No change.	No change.	May fit in with possible long range plans of Portland Planning Dept. for "waterfront transformation".	No change	Contrary to present "waterfront transformation" plans outlined by Portland Planning Dept.
Employment and Income	No change.	Additional temporary employment in construction and related jobs.	Additional temporary employment.	Additional temporary employment	Additional temporary employment
Relocation	None.	None.	Some necessary - dependent on length of bridge and location of exits.	Minimal, if any, dependent on location of exits.	Contingent on acquisition of land for new facilities.
Air-Noise Quality	No change.	Increase in air and noise pollution during alterations only.	Increase in air and noise pollution during construction only.	Increased air and noise pollution during construction only,	Increased during construction and in long run.

ENVIRONMENTAL CONSEQUENCES

IMPACTS	* ALTERNATE 1 DO NOTHING	ALTERNATES 2 and 3 ALTERATION OF EXISTING BRIDGE. POSSIBLE CHANNEL DEEPENING.	ALTERNATES 4 and 5 REPLACEMENT WITH HIGH LEVEL BRIDGE . POSSIBLE CHANNEL DEEPENING.	ALTERNATES 6 and 7 ADJACENT LOW LEVEL BRIDGE VERTICAL LIFT POSSIBLE CHANNEL DEEPENING	ALTERNATE 8 COMMON TERMINAL AND PIPELINE
Dredging	Maintenance of 35-foot channel required.	No. 2-slight impact due to increased size of turning basin. No. 3-substantial impact due to increased turning basin and increase in channel depth.	No.4-Same impact as 2. No.5-Same impact as 3.	No. 6- Same impacts as 2. NO. 7-Same impacts as 3.	Slight increase due to new berthing area.
Disturbing New Areas	Disposal Site required for dredged materials.	Would have increased impacts doe to increase in turning basin and channel depth.	Same impact as 2 and 3.	No. 6- Same impacts as 2. No. 7- Same impacts as 3.	Substantial increase on ocean bottom, mudflats and upland areas.
Pollutants Released Through Dredging	Turbidity, organic material and heavy metals.	No. 2-Slightly increased impact. No. 3-Substantial impact.	No. 4-Same impacts as 2. No. 5-Same impacts as 3.	No. 6- Same impacts as 2. No. 7- Same impacts as 3.	Slight increase at berthing sites.
Construction Activities	None	Substantially increased impacts.	Same impacts as 2 and 3 but substantial increase over these alternatives if fill is used for bridge.	Same as 4 and 5	Substantial increase at tank site.

*All Alternates Compared to "Do Nothing".

SUMMARY OF COSTS AND BENEFITS*

Total Costs	0	No. 2 -- $47,480 No. 3 -- $61,870	No. 4 -- $51,130 No. 5 -- $65,515	No. 6 -- $35,350 No. 7 -- $49,740	$30,220
Total Annual Costs	0	No. 2 -- $3,180 No. 3 -- $4,170	No. 4 -- $3,430 No. 5 -- $4,410	No. 6 -- $2,370 No. 7 -- $3,360	$2,820
Total Benefits	0	No. 2 -- $1,090 No. 3 -- $3,020	No. 4 -- $1,260 No. 5 -- $3,190	No. 6 -- $1,150 No. 7 -- $3,080	$3,000
B/C	0 0	No. 2 -- 0.34 No. 3 -- 0.72	No. 4 -- 0.37 No. 5 -- 0.72	No. 6 -- 0.49 No. 7 -- 0.92	1.06

* All Costs in Thousands of Dollars

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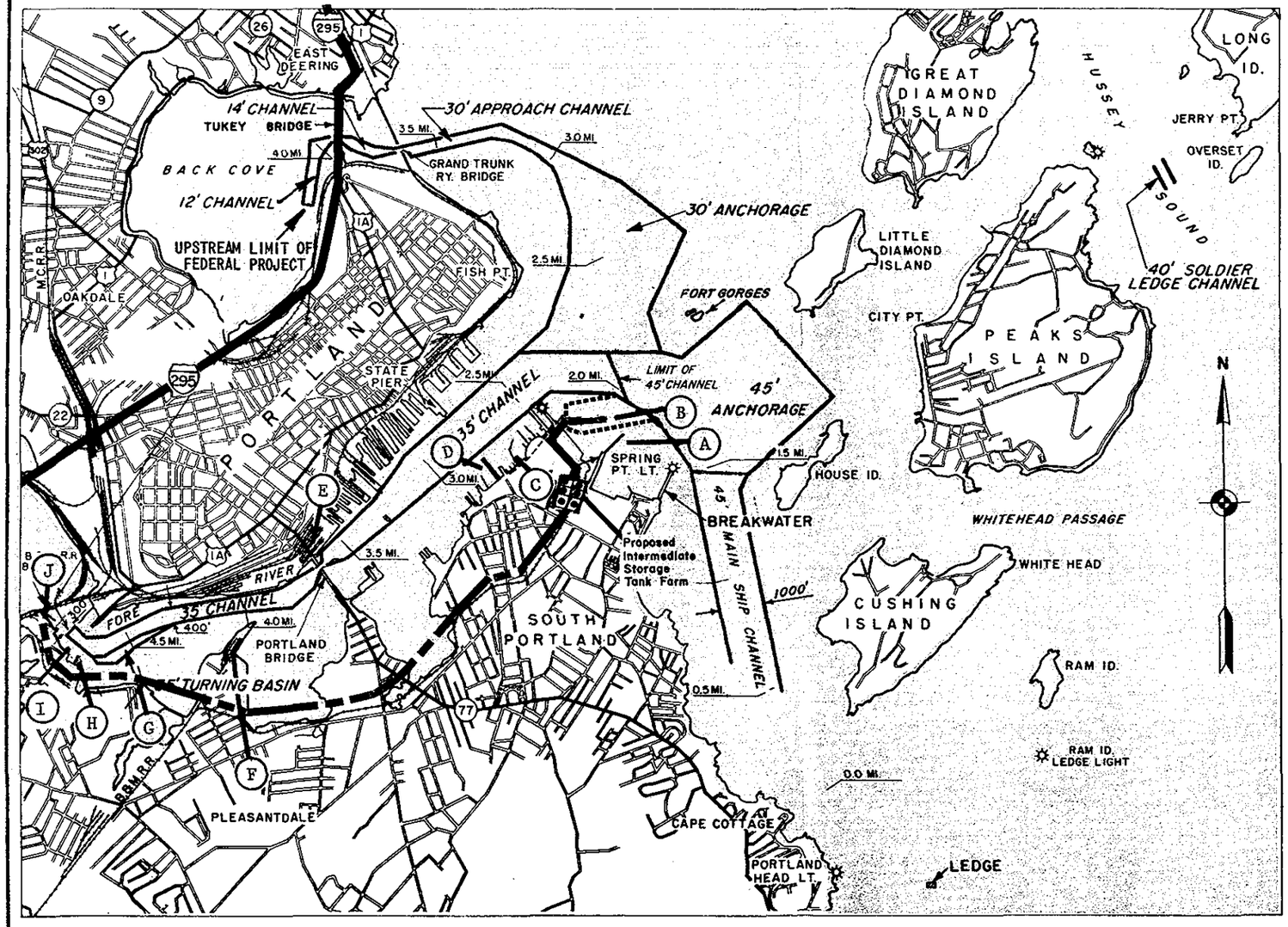

Summary of Alternatives

Plan No.	Channel Depth	
1	35 ft	Existing Conditions - No Improvement.
2	35 ft	Alter Bridge to 250 ft opening, increase size of turning basin.
3	40 ft	Same as Plan 2 and increase channel depth.
4	35 ft	Replace existing bridge with new high level fixed bridge, increase size of turning basin.
5	40 ft	Same as Plan 4 and increase channel depth.
6	35 ft	Replace existing bridge with low level vertical lift bridge - 250 ft opening, increase size of turning basin.
7	40 ft	Same as Plan 6 and increase channel depth.
8	-	Common terminal and pipeline distribution system.

Location		Location	
A	Portland Pipeline Pier #2	G	Amoco Oil Co. Wharf
B	Possible Common Terminal (2 Berths)	H	Mobil Oil Co. Dock also serves Northeast Pet. Co. & Gibbs/BP Oil
C	Chevron Oil Co. Dock	I	Northeast Petroleum Wharf
D	Portland Pipeline Pier #1	J	Bancroft and Martin Docks also serves Exxon, Getty, Gulf, Shell, and Gibbs/ BP Oil Companies
E	Portland Bridge Horiz. Opening 98 ft.		
F	Texaco Oil Co. Wharf		

WATER RESOURCES IMPROVEMENT STUDY FORE RIVER PORTLAND HARBOR, MAINE

JULY 1977

IN 1 SHEET SCALE IN FEET

1000 0 1000 2000 3000 4000

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.